Understanding Pragmatic Language Development: Comparing Adults and Children

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by

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Abstract

This study addresses the connection between children's developing knowledge of prosody – specifically their use of pitch when producing language – and pragmatics – their use of language in plausible ways, to convey and comprehend meaning, whether spoken or unspoken. Previous studies on this topic show that adult comprehension of the quantifier 'some' is different when 'some' is produced with what we refer to as a "pitch accent" or sudden variation in pitch that indicates a change in meaning. While children have been shown to grasp this difference in meaning, previous work suggests that they attend to word duration and not pitch in an experiment (Thorward 2009) that compared phonetic variants of *some*. Further, it has been proposed (Snow 2006) that prosodic development parallels morphosyntactic development. In my project, I investigate two questions: 1) at what point do children come to have adult-like knowledge of the pragmatic-prosody interaction in their use of phonetic variants of the quantifier *some*? and 2) is there a relationship between morphosyntactic development and pitch accent perception? To answer these questions, I test a sample of typically-developing, monolingual English-speakers. The measure of prosodic and pragmatic knowledge is a video-recorded Truth Value Judgment Task (TVJT), which provides a measure of accuracy and a measure of language processing (reaction time). Children were also given a standardized test of language, which includes a measure of morphosyntactic development, which I compare to their interpretation accuracy and reaction time results from the TVJT. Results suggest that our school-aged children (5-8 year-olds) behave similarly to preschool children in not grasping the meaning of pitch accent, and there is so far no discernable relationship between morphosyntactic development and measures of prosody/pragmatics. However, our results show a tendency that suggests that the faster the reaction time with *some*, the better children do better at inflection.

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Chapter 1 – Introduction

Overview

Children seem to know a great deal about language from a very young age (Crain & Lillo-Martin 1999, Lust 2006). Their expressive knowledge of prosody, however, seems to only develop gradually in English. Snow (2006) has speculated that their knowledge of prosody undergoes a qualitative leap when two-word syntax begins to be used, though this claim has been disputed (e.g. Chen & Fikkert 2007, Frota & Vigário 2008). Phonology, and the prosody of pitch accents in particular (Beckman & Pierrehumbert 1986), appears critical to expressing the meaning associated with conversational scalar implicatures of quantity in English. In this thesis, I will pursue Snow's speculation to determine whether children's knowledge of morphosyntax and their knowledge of prosody, as measured in our experiments, are related. Secondly I will consider the proposition that a general delay in the development of prosody causes a delay in child English-speaker's ability to comprehend prosodically-conditioned sentences expressing pragmatic implicatures, in comparison to child Spanish-speaker's grasp of the same implicatures in Spanish, which does not depend critically on the use of prosody to signal implicatures, but rather lexicalizes the differences into distinct words: *unos* and *algunos*. Both these words refer to *some* yet are specific to their usage unlike English. In English, we use only one *some* to refer to implicature generating and canceling environments and must be interpreted in their usage. Spanish clearly has different words in order to ease this understanding at a younger age.

Conversational Implicatures

Conversational implicatures are a dimension of unsaid meaning that is produced in specific pragmatic contexts (Grice 1975). The quantifiers of a language like English, according to Horn (1972), fall on a scale of strength {none, few, some, many, most, all} on which the use of a weaker quantifier implicates that a stronger quantifier would not have been felicitous. In this way, if it is true that all students came to class, sentence 1. would be logically true because if all students came, then some students came, in the same way that if 20 students came, it is also true that 10 students came. However, as Grice pointed out, saying sentence 1., if all students came to class, is not really giving enough information. For this reason, if all students came to class, sentence 1. would violate Grice's Maxim of Quantity, under the assumption that the speaker is being cooperative.

1. Some students came to class.
2. All students came to class.

The "some, but not all" implicature associated with sentence 1., then, is referred to as a conversational implicature that is a quantity implicature and a scalar implicature. Pragmatic meaning, however, seems to interact with phonology in English.

Previous work has shown that adult comprehension and child comprehension of, for example, the quantifier 'some' is different when 'some' is produced with what we refer to as a "pitch accent" or sudden variation in pitch that indicates a change in meaning (Thorward 2009, Grinstead et al 2010). The change in meaning from the logical "some and possibly all" to the pragmatically-enriched "some, but not all" is signaled in the adult language by the addition of a rising pitch accent to the quantifier. Preschool children do not seem to grasp this distinction. This project addresses the connection between children's developing knowledge of prosody – their

use of pitch when producing language – and pragmatics – their use of language in plausible ways, to convey and comprehend meaning, whether spoken or unspoken. The overall goal of this project is to study the degree to which English-speaking preschool children's inability to grasp this pragmatic meaning, signaled by prosody, is specific to English and to the fact that prosodic development has its own delayed trajectory, given that in other child languages that do not use prosody to signal the meaning, children understand the meaning much earlier (Vargas-Tokuda et al 2009).

1.1 Implicatures in Child Language

There has been renewed debate over the last 15 years regarding what children know about the semantics and pragmatics of logical terms such as "some", "all", "each" and "or". The Spanish and English languages present themselves differently when studying child pragmatic skills. In Spanish, it has been argued that children understand when to use the two different types of "some" quantifiers, *algunos* verses *unos.* In English, however, almost all of the logically possible claims have been made. Beilin & Lust (1975) and Johansson (1977) argue that children are unable to access the logical meaning of quantifiers such as 'some' and 'or'. However, other researchers, such as Noveck, have argued this point and say the opposite: that children understand the logical meaning of quantifiers such as "some" but do not grasp its pragmatic meaning. Further, Guasti (2005) claims that children understand both logical and pragmatic meanings and in Italian, children can produce both in terms of the quantifier "some." Guasti's claims seem the best substantiated.

Johansson (1977)

Many studies have looked at the development between child's mastery of the words *and* and *or*. Johansson (1977) aims to discover if children are able to generate the various interpretations of *and* and *or*, specifically *or* implying *and*. However, these two words create different meanings when put in logical and linguistic contexts. According to Tarski (1965), the logical meaning of *and* and *or* is very specific; *and* combines two sentences while *or* can take on an inclusive or exclusive interpretation to whether one or both the sentences are true in a statement. Instead, both *and* and *or* can combine questions, statements, wishes and expressions that are always affected by contextual factors to determine the specificity of *and* and *or* (Dik 1968). Johansson cites two studies that have sought to determine at what age the words *and* and *or* are mastered; Johansson & Sjolin (1975) showed that *and* and *or* are mastered as words at age four, but the logical meaning is not mastered until high school according to Neimark & Slotnick (1970). To determine if there is a relationship between logic and language in development, Johansson (1977) designed an experiment to answer this question.

In Johansson's experiment three tests are given to ten subjects in the age groups of 6, 7, 8, 9, 10, 12, and 22 years old; these tests consist of (1) word usage, (2) logical test, and (3), word understanding. However, the word usage test is disregarded in the study because of unrelated results. The goal of the definition test is to study the development of understanding of *and* and *or*. In this experiment, the child was told to define the meaning of the word "horse" to a foreigner who does not know the meaning. After the child produced an acceptable definition, they were then to define *and* and *or*. According to Vygotsky's (1962) theory of concept development, children's way of defining terms changes as they get older. In fact, smaller children seem to use more examples to define a concept (Spontaneous Mastery) while older children define concepts

more concretely with other concepts (Conscious Mastery). Results from the definition test follow Vygotsky's theory and Johansson determines that after age ten, most children master *and* and *or* on a conscious level. Furthermore, these children who have mastered the conscious level should also be able to solve the logical test.

The goal of the logical test is to determine changes in performance as a function of age through a series of questions based on drawn images. The same groups of children were given a sheet of paper with eight different combinations of shapes (square, triangle, circle) and colors (yellow, blue, red). The children were asked four different tasks:

3. Encircle all the figures that are blue *and* square.
4. Encircle all the figures that are blue *and* all that are square.
5. Encircle all the figures that are blue *or* square.
6. Encircle all the figures that are blue, *or* all that are square.

Each sentence contains a different type of command and asks the child to perform a distinct task. However, each sentence could be ambiguous and interpreted in a different way. If language and logic are in fact related to one another, then the action of these commands should follow a similar performance from the logical test and should depend on the mastery of the words *and* and *or*. Sentence (3) specifically determines the child's comprehension of the implied *and*. In other words, when asked to circle the figures that are blue *or* square, the interpretation could be to circle one or the other, versus both. Kids seem to use only the logical *or* and choose only one figure rather than both. Although the results seem to reflect incorrect child interpretations, experimenters did not provide enough pragmatic contexts for the children to

cancel the implicature that forces the exclusive "or" meaning. The lack of sophistication in the experiment could account for wrong answers and thus does not give strongly reliable responses.

Further results show a correlation between mastering the word *and* and the logic test but a significantly stronger correlation between the logic test and *or*. Those subjects who defined *and* and *or* with examples in the definition test often repeated the same responses in the logic test. In addition, the subjects who did not use examples as definitions seemed to score higher on the logic test, thus indicating a close relationship between mastering *and* and *or* and logic. Johansson takes the results to support Vygotsky's (1962) view that language and thought are interconnected. However, as a test to determine if children comprehend logical vs. pragmatically-enriched *or*, the study is not successful as the test does not provide enough context to cancel the pragmatic implicature associated with exclusive *or*.

Noveck (2001)

Through a series of experiments, Noveck has sought to understand child verses adult-like behavior in responses to implicatures. In fact, three studies, Smith 1980, Braine and Rumain 1981, and Paris 1973, all found that children 7-9 years old treat the term "some" as meaning "all." However, they found this to change with age as adults understand "some" as "not all." On this basis, Noveck claims that children show themselves as naturally logical, but time and pragmatics seem to influence their understanding and use of these terms.

One of the experiments focuses on another pragmatic scale that includes the modal verbs "might" and the stronger "must". When determining if "might" applies to situations, children and adults determine whether the stronger term "must" should be used, as a function of pragmatics, as with "some" and "all". Through an experiment of determining if a stuffed parrot is in a box or

not, using the term "might," 7 and 9 year olds seem to use the weaker, logically true, interpretation, in contrast to adults. They do in fact treat "might" as "has to" at this young age while adults take other possibilities into consideration with "might." Therefore, Noveck concludes that pragmatic interpretations are developed at a later age. It is proposed that adults assume the use of scalar implicatures and detect what a sentence is trying to imply rather than think at the logical level that children do. However, when adults receive training to think logically before performing the actual task, they succeed in agreeing with child-like behavior and answering at the logical rather than pragmatic level.

In another experiment, Noveck tests French-speaking children with the quantifier "some" or *certain* to judge similar parameters of child and adult pragmatic comprehension and use. Through a series of sentences, children and adults were asked to verify if the statement was true or false with each sentence beginning with "some;" some meaning all or some meaning not all, logical or pragmatic respectively. Results showed that children successfully disagreed with many of the "wrong" statements and could detect reality and facts with sentences of "some but not all." However, children did not seem to align with adult answers when interpreting "underinformative" sentences such as "Some giraffes have long necks." In fact 89% of 7-8 year olds and 85% of 10-11 year olds answered "Yes" when determining if this sentence was true while only 41% of adults agreed. These results, according to Noveck, showed that although children can master logical and factual meanings, they disregard pragmatics in utterances that may in fact have other possibilities. It is also important to note that although most children did not use pragmatic judgment in these experiments, it does not mean they do not understand the pragmatic perspective, but rather it shows they do not have a strong grasp of this area and do not use it regularly enough. According to Noveck, with time, development, and more exposure,

children will begin to account for many of these implicatures and begin to incorporate more adult-like responses into his or her daily routine.

What Noveck fails to account for in this experiment is context in his questions. It can be argued that children are not able to judge under-informative utterances as infelicitous because the lack of context leads children to come up with a wide variety of interpretations. With sufficient background information framing the statements, scalar implicatures could be made available to children and demonstrate their true pragmatic competence. This reason could account for Noveck's conclusion that children do not understand pragmatics, and adjustments in facilitating this experiment may lead to differing results**.**

Guasti et al 2005

Guasti replicates Noveck's (2001) experiment testing child comprehension of *some* and *all* but with Italian 7-year old children. Through multiple experiments, Guasti found similar results compared to Noveck in which children accept pragmatically infelicitous statements much more than adults do in a series of sentences using quantifiers such as *some* and *all*. After producing similar results, Guasti includes a training step in the experiment, similar to Papafragou and Musolino's (2003) study. Likewise, training does in fact improve results for infelicitous sentences such as *Some giraffes have long necks*. However, Guasti then seeks to discover whether the children retain the pragmatic understanding a week later; unfortunately the children did not and once again performed as they did the first time without training. Finally, Guasti used a Truth Value Judgment Test to determine if conversational speech rather than formulated sentences had a different effect on the Italian children.

What was found through these three experimentations was that 7-year-old children performed much better in a more pragmatically detailed scenario, by providing adult-like

responses while giving an explanation for their answers. The children rejected sentences much in the same ways as adults did. This experiment demonstrates that children are in fact pragmatically competent when put in experimental settings with sufficient pragmatic context and hold a strong grasp of scalar implicatures and their use in these settings. To account for the failure in previous experiments, the results could have occurred because children did not understand what was expected of them or fully recognize scalar implications in the experiment. Contrary to Noveck's conclusion, Guasti et al claim that children do have the ability to compute scalar implicatures and that their failure on Noveck's task was a result of the absence of contextual support for pragmatically enriched interpretations. Whether or not 5 to 6 year old children can also perform in the same way is still not determined. Further studies with this group must be taken to conclude if this age range has a developmental effect or not.

Papafragou & Tantalou 2004

While Guasti et al (2005) shows that Italian children compute scalar implicatures such as *some,* Papafragou & Tantalou (2004) demonstrate that Greek-speaking children also compute implicature generation with contrastive stress. Unlike previous studies, Papafragou and Tantalou show that children as young as 4 years old are capable of computing implicatures and that intonation and contrastive stress matter. In their study, they use three types of tests to determine the uses of implicatures; the quantificational, encyclopedic, and ad hoc scales. The quantificational condition consisted of using the scale *oli, meriki*, the Greek word for *all, some.* The encyclopedic condition relied on world knowledge supported by a picture or visual cue. Finally, the ad hoc condition included a range of specific context ordering sentences that depended on the circumstance. Previous studies have relied on truth value/ pragmatic judgments

to test computation of scalar implicatures. However, Papafragou & Tantalou (2004) took a different approach to discover why children have failed earlier implicature generating experiments.

In this experiment, thirty Greek-speaking children played a game with animals, each animal assigned with a different job. If the child believed that the animal performed the job correctly, he or she would give the animal a prize. Each child was placed in a different condition: quantificational, encyclopedic, or ad hoc. If the child did not give the prize to the animal, he demonstrated the ability to compute scalar implicatures. Then, the child's explanation of his choice would reinforce his understanding of the implicature generated context. On the other hand, if the child awarded prizes too often to the animals, he would be viewed as ignoring scalar implicatures and instead interpreting *some* as *all.* For example, in the quantificational condition, the experimenter told the elephant his job was to color paper stars. Once the elephant completed the task, the experimenter asked a question to the elephant. The child then had to decide if the animal should receive a prize or not and why:

7. Experimenter: Did you color the stars?
8. Elephant: I colored some.

After children determined if the elephant should receive a prize, based on whether the job was completed or not, their results gave clear responses. The control group results of each condition provide strong confirmation that children understand what was asked and implied from the simulation. In fact, the children show success in 97.5% of the quantifiers, 100% of encyclopedic, and 92.5% in the ad hoc trials after being given a test trial. A consistent correct

response in each test, with limited variability, rejects previous hypotheses, and instead confirms children's ability to compute scalar implicatures and the "importance of task demands" (cf. Papafragou and Musolino 2003). Furthermore, Papafragou and Tantalou find that Greek children are sensitive to logical, stable, and arbitrary orderings to become aware of implicatures based on these three scales of testing. This study shows that children become more aware of using pragmatic judgment when training has been given beforehand and rejects previous studies that children have difficulty with scalar implicatures in truth value/appropriateness judgment tasks.

Miller et al 2005

Miller et al (2005) was the next study exploring what children know about pragmatic implicatures that took into account contrastive stress, in English. Though they do not say more about stress other than that it was there or not, they are at least explicit about it.

Studies have shown that children cannot disambiguate a sentence when only stress is involved. Instead, children guess at the interpretation of the sentences at hand and test his or her working memory. Therefore, Miller et al began a study to determine if children can make sense of scalar implicatures when stress is put on the word *some*. The first experiment tested stress by evaluating children's interpretations of the stress and unstressed *some* and non/presuppositional sentences. Thirty-six children (4;1- 5;5) and thirty-one adults were split up to different groups (12 children per condition, 10 adults for C1, 12 adults for C2, and 9 adults for C3) each with a different combination of stress and presupposition, following a Direct Instruction Task paired with pictures. Both children and adult subject groups were given four blank pictures of faces and asked to:

9. C1: Make some faces HAPPY (unstressed *some*/presuppositional)
10. C2: Make SOME faces happy (stressed *some*/ presuppositional)
11. C3: Make some HAPPY faces (unstressed *some*/ non-presuppositional)

Results showed that both children and adults behave similarly in the C2 and C3 but fail to agree with the C1 condition. These results demonstrate that children can understand the scalar implicatures when *some* is paired with stress but then cannot do the same in an unstressed situation. Also, both adults and children do not compute quantity implicatures in sentences with non-presuppositional conditions.

In the second experiment, Miller et al uses a Picture Matching Task rather than Direct Instruction Task. Here, a puppet draws a smile onto three blank pictures of faces, and then children and adult subjects were asked to respond to either sentence:

12. C1: Show me where Pete made some faces HAPPY (unstressed)
13. C2: Show me where Pete made SOME faces Happy (stressed)

The participants were to choose Picture 1, all faces filled in with smiles, Picture 2, no faces with smiles, or Picture 3, three of four faces with smiles. Results showed that like the previous experiment, children interpret stressed verses unstressed *some* differently from one another, but here, children display adult-like behavior in both conditions. The visual task and the prosodic focus associated with this experiment may influence the way both children and adults interpret quantity implicatures associated with stress. Miller and Schmitt (2004) produce similar evidence with the Spanish *some* or *algunos* in a Direct Instruction Task experiment using Chilean-

speaking subjects. Fifteen younger children (4;6-5;11), fifteen older children (6:0-7;6), and ten adults were tested as Spanish-speakers in this experiment. To test comprehension of *algunos* or *some,* participants were asked to perform specific tasks such as:

14. Pon *algunas* bolitas en la tapa (Put some marbles in the tray)
15. Pon *algunas de las* bolitas en la tapa (some of the)
16. Pon *todas las* bolitas en la tapa (all of the)

The participants were asked to put *algunos* marbles in a tray in order to determine the *some* verse *all* quantity implicatures. Supporting the first two experiments, the majority of responses displayed partitive responses when provided with stress. Therefore, Chilean children also are able to interpret implicatures much easier when enforced. This could be because the overt partitive sentence (15) *algunas de las* could have helped the kids understand the other sentences, specifically sentence (14) in which the task was to put *some but not all* marbles in the tray. Here, the initial overt partitive may have triggered the understanding of what the covert partitive implied; the child could now distinguish between the different type of *some- algunas* versus *algunas de las*.

Overall, Miller et al contrasts with previous studies, such as Noveck's experiment, in that Miller et al show that English-speaking children can in fact calculate implicatures with *some* and are better at doing so when presented with stress. Furthermore, Miller et al agrees with Papafragou & Tantalou in saying that children's difficulty with implicatures from previous studies may have been generated from the instructions given and that when simplifying the

experiment, children are able to process implicatures and produce adult-like behavior when paired with contrastive stress.

Vargas-Tokuda et al (2009)

After observing English speaking children and their use of scalar implicatures, it is important to compare the same results of using specific quantifiers such as "some" to clearly understand the pragmatic knowledge across cultures and languages. In English, paralinguistic knowledge such as intonation and stress on the word "some" seem to define what a speaker is attempting to convey. However, in Spanish, there are two different words to determine "some but not all," or *algunos*, and "some but not others," or *unos*. *Unos* cannot be used in a noun phrase that has already been introduced to discourse. It must be discourse-new information (Gutiérrez-Rexach 2001). *Algunos*, in contrast, is essentially always connected to discourse, associated with an implicature, unless it is presented in a downward entailing (DE) context.

Vargas-Tokuda et al's experiment tested twenty-seven monolingual, Spanish-speaking children (ages 4;9-6;7, mean age=5;9) and ten adults from Mexico City. The goal of the experiment was to determine if children are able to generate pragmatic implicatures with *algunos* in linguistic contexts and generate alternative interpretations for *unos* without linguistic contexts. The children were given a Truth Value Judgment Task and presented with a story acted out by puppets. They were then asked to determine if descriptions of the story were appropriate or not. Results showed that children are in fact able to generate implicatures with *algunos* and that young child can differentiate *unos* from *algunos*. Another finding from the experiment is that children generate an implicature with *algunos* and cancel it in downward entailing contexts (irrealis grammatical contexts that reverse the pattern of entailments from sets to subsets).

Further, they do not generate an implicature with *unos* and do not cancel it (because it had never been generated) in downward entailing contexts.

1.2 Intonation in Child Language

In parallel with the line of research investigating children's understanding of pragmatic implicatures is a line of research that independently investigates what children know about intonation and its relevance for conveying pragmatic information. This is important for this study in that we are interested in how pitch accent interacts with interpretations of pragmatic implicatures in child language.

Snow (2006)

Many theories have questioned if children are able to control falling and rising contours before or after 12 months of age. One theory by Lieberman (1967), the Biologically Oriented Breath Group, believes before 12 months old a child has control of such physiological mechanisms. This theory predicts that falling intonation follow a linear pattern and develops differently from rising intonation as falls are controlled by the physiological mechanism (Snow 284). On the other hand, according to studies by Vihman et al (1996) the Regression-Reorganization Theory contrasts the breath group and instead uses a linguistic oriented model to say that a child's intonation control will develop after 12 months of age. In fact, this theory predicts that falling patterns reflect a nonlinear pattern of acquisition, develop similarly to rising tones, and is controlled by intentional linguistic mechanisms rather than physiological ones (Snow 284). To test both these hypotheses, Snow investigates each theory through a series of experiments. Ten children between 6 and 23 months, along with their parent and an

experimenter, participated in an experimental play sessions. Research assistants then analyzed the utterances of vocalizations produced by the child.

As a result of this study, Snow speculates that intonation develops at the stage of development corresponding to the onset of multi-word combinations around eighteen months rather than the onset of one word speech at around ten months old. Furthermore, although children begin to develop intonation before speech, there is a decline in accent range between 9 to 11 months old and rises again at around 18 months old. In other words, there is no linear pattern of consistency for children developing intonation. Snow uses a "U-shaped" model to describe these findings and shows that result align with the Regression-Reorganization Theory. However, this study also discovers that children within the age groups showed results different from one another. In fact, the youngest group, ages 6 to 8 months, displayed a wider range of accents than an older group, 9 to 14 months.

This study illustrates that both the Breath Group and Regression-Reorganization Theory are both used to describe English-speaking children's acquisition of intonation. However, the most interesting finding is that the 6 to 8 month year olds produced intonation in a more mature way than the older toddlers of 21 to 23 months old, suggesting that biological tendencies of the breath group are in play and govern the intonation for this younger group of infants. In addition, the results support the claim that falling intonation patterns have a wider accent range than rising ones. This difference in accent range and frequency can be attributed to the breath group's idea of different physiological bases. Another part of the study Snow focused on was the syllable duration and the relationship between pitch and duration. Snow found that intonation is not dependent on the speech timing systems.

Overall, Snow claims that intonation develops in combination with physiological and linguistic factors, not one or the other. Snow notes that a combination of both hypotheses from the breath and regression-reorganization groups can account for a child's early acquisition of intonation. In the end, Snow speculates that the development of intonation is highly related to the development of two-word speech, or syntactic recombination. This speculation gave rise to a series of responses from other researchers, to which I now turn.

Chen & Fikkert (2007)

Chen & Fikkert (2007) investigate the speculation put forth by Snow (2006) regarding the connection between the development of intonation and two-word syntax. They analyze intonational development in three young Dutch children to determine patterns in intonation in the Dutch language and its relationship to English as well as other languages. These researchers mention that intonation varies between languages and establishing these properties early in age determines how a child sounds like a native speaker. Chen and Fikkert note that many studies focusing on the English language find that children gain adult like intonation patterns or contours before the onset of two-word utterances. However, Chen and Fikkert note that though they may begin using intonational contours before two word speech begins, they are not yet adult-like, for example, when a falling pitch occurs in multi-word utterances.

Another issue Chen and Fikkert raise is the placement of sentence accents cross-linguistically. For example, one example mentioned describes how accent can be placed on the first syllable rather than the second, and accent is determined by semantic rather than syntactic relationships.

To find if the semantic relation and information of words affect the accent placement in two-word utterances, Chen and Fikkert focused on the deaccentuation expressed by the children in the study. Their study used three typically developing Dutch children between ages 1;4 to 2;1. Over the course of a year, these children were recorded in a play session on a biweekly basis. Utterances were recorded and the changes in prosodic features such as pauses and stress were collected and analyzed over time. What they found was that Dutch children master nuclear pitch accent types at 160-word level and at 230-words they master the non-downstepped pre-nuclear pitch accent types.

Overall, Chen and Fikkert have collected data in Dutch children showing that falls are more common that rises in two word utterances, similar to English, German, and French. Also, accent placement in Dutch does not always fall on the first or second word but rather occurs on both words. Finally, the data shows that unlike adult Dutch speakers, Dutch children produce words or utterances of final syllable for a longer time period and more often. Although Chen and Fikkert have established certain intonation aspects cross-linguistically, many of their questions still come into play and have yet to be answered. Accent placement and intonation can further be studied and compared from one language to another. Snow (2006) concludes that the combination of biological tendencies and linguistic influences affect children's acquisition of intonation. In accordance to Snow's findings, Chen and Fikkert follow similar patterns of falling contours; they also agree that falls are more common than rises in children. Snow's explanation for child intonational development can now be better understood as not the only factor that determines time and use of intonation, but it is rather the culmination of biological factors and linguistic influences of human development. Furthermore, although Snow finds that intonation develops before the onset of word combinations, Chen and Fikkert's study is unable to support

this argument. Instead according to their data children put accents independently on both words in two-word utterances as they are still determining intonation placement at this stage.

Frota & Vigário (2008)

To better understand the relationship between intonation and grammar, Sonia Frota and Marina Vigário have studied and analyzed the intonational properties in young Portuguese children. The purpose of their study was to determine the point at which children become adult-like with respect to their use of intonation. The main questions the study focused on included pitch accents, alignment and scaling, and prosodic properties of early utterances. In the study, Frota and Vigário videotaped one monolingual Portuguese-speaking child (between 1;00 and 2;02) through a longitudinal study for an hour every other week and then phonetically transcribed hundreds of utterances.

Results showed that although there is a relationship between accent and stress during speech, stress is not prompted by tone. The main phonetic correlate for word stress is found to be duration. In fact, they found that H+L* is the most common nuclear accent in European Portuguese but children do not hold adult-like consistency until about the age 1;09. In terms of pitch scaling, or changing pitch without changing its speed, pitch is reflected mostly in later speech when more words or utterances are produced at a slightly older age. Results also showed that H* is adult-like at an earlier age (1;02) and stress patterns become stable after 1;09. In other words, this type of pitch property is not commonly used right away but is developed over time. Frota and Vigário conclude that intonational development correlates with an increase of vocabulary size, rather than word combinations, as suggested by Snow. This relationship between intonation and vocabulary size correlates not only in Portuguese but other languages as well such as Dutch. Overall, Frota and Vigário have established that children produce more

adult-like speech as they continue to increase the utterances and speech as they get older and are exposed to a greater vocabulary.

Prieto et al (2012)

Prieto et al (2012) analyzes similarities and differences between Catalan and Spanish-speaking children through intonation development patterns. Over the course of a few years, children of both languages were observed and transcribed to investigate if prosody affects syntactical and lexical development. In other words, the goal is to determine what the relationship is among prosodic development, grammatical development and lexical development. While Snow speculates that combinatorial syntax appears at the same time as intonational growth, Prieto et al suggest that these two qualities do not appear simultaneously. In fact, they found that the Catalan children displayed intonational grammar similar to adults at varying ages in spite of their grammatical development. Data from the Spanish and Catalan study indicate that children master pitch accents at a very early age to produce intonational contours. Thus, intonation is not affected by MLU, contradicting Snow's hypothesis.

However, physiological and biological hypotheses seem to coincide with another observation by Snow. Prieto's findings align with Snow's observation that certain intonational patterns may be a result of a natural fall mechanism contour that naturally occurs due to a decrease in subglottal air pressure. Biological qualities drive the intonational patterns at early ages across different types of utterances. However, other arguments question this hypothesis such as Chen and Fikkert's study of Dutch and Portuguese speakers. Their studies suggest a more complex pattern of pitch and contours, both rising and falling. Prieto also questions the physiological hypothesis as she finds that children have a strong grasp of the rising and falling

contours at the onset of speech. Thus, physiological factors may play a slight role but do not account for every factor in Spanish and Catalan speaking children.

Finally, the goal of Prieto et al's study was to find the relationship between prosodic, lexical, and grammatical development in Catalan and Spanish-speaking children. Results find that there is a close correlation between lexical and intonational development and no correlation in regards to grammatical development. Lexicon and intonation seem to correlate similarly between children. However, although some children produce grammar and intonation patterns at the same time, this does not occur similarly between each child, showing no consistent pattern. Overall, what is found is that the onset of speech indicates that there is a close correlation between intonational and lexical development.

1.3 – Intonation and Implicatures in Child Language

Ito et al (2012)

Through an eye-tracking experiment, Ito et al (2012) report on a study of the influence of intonation and pitch on adjectives in discourse with Japanese adults and children. Because Japanese is a pitch accent language (a language in which words have lexically determined pitch accents), the experiment questions whether Japanese participants would respond the same or differently than English or German speakers with similar pitch contrasts within sentences. This study also questions whether children comprehend the production of contrastive pitch prominence in accordance to timing and manner development in language. Studies have suggested that children can express contrastive stress at a very young age; however, Cruttenden (1985) has shown that preschoolers' understanding of prosody is not mastered in an adult way

until later development. In a picture naming experiment by Cruttenden and Wells et al. (2004), ten year old children chose pictures based on isolated stressed utterances. The goal of this study was to show that emphasizing different words in the sentences reflected choosing alternate pictures such as in the following sentences:

17. “John’s got FOUR oranges”
18. “John’s got four ORANGES”

In this example, most adults chose the correct picture that matched with each sentence while the children did not. Although the children’s performance improved with age, the study lacked sufficient discourse context and relationships between referents. Therefore, the failure to choose the correct pictures could have been attributed to the context-free tasks.

Ito et al advances this study to an eye-tracking experiment to test whether pitch accent evokes contrastive interpretation in Japanese children (Ito et al 2012). In this experiment, forty-six adults and forty-four 6-year old Japanese speaking children observed a chart of six different animals colored in three different ways. Each animal and color combination held a different lexical accent. The child was then supposed to quickly point to the matching picture on the screen. For example:

19. Q1: “Where is <u>the pink cat</u>?” (No emphasis on speech)
20. Q2: “Then, where is <u>the **green** cat</u>?” (Alternating emphasis on the color)

Results showed that children (6 years old) are not able to grasp the same adult-like interpretation with this short amount of time. Eye fixation on animals or color seemed to interfere with results. Unlike adults, the pitch range on the different words did not influence child fixation patterns. In other words, when putting emphasis on the color green in Q2, the adults successfully held their gaze longer at the green images on the screen while the children did not. However, a second trial was done allowing for a longer reaction time. When given more time to respond, the children were thus able to grasp the adult-like interpretations. Ito et al further suggest that there is a comprehension-production disconnect. In other words, although children produce pitch accented utterances, they do not always comprehend the meaning and usage of pitch. Most importantly, Ito et al show that Japanese children may have adult-like interpretations of pitch-accented utterances, but need more time to generate them than do adults.

Thorward (2009), Grinstead et al (2010)

Previous studies have shown that languages apart from English do in fact compute and cancel implicatures associated with *some* such as in Greek (Papafragou & Tantalou 2004) and Italian (Guasti 2005). To better understand scalar implicatures, Thorward (2009) tested both children and adult comprehension of various interpretations of the quantifier *some*. Thorward further investigates these previous findings in the English language through understanding *sm* (a vowel-reduced existential), *some* (a full-vowel de-accented adaptation), and *SOME* (a pitch-accented version). Both pitch accent and vowel duration play a part in implicature generation, but Thorward additionally questions English-speakers' understanding of these within downward entailing and non-downward entailing environments.

The first experiment records fourteen hours of adult spontaneous production of talk radio programs. Both *sm* and *some* were found to be used much more than *SOME*. The reduction of vowel or pitch accent seemed to create uncertainty of *some* as it conveyed both existential and implicature meanings.

The second experiment tested 51 adults (19;0-63;11) in a Truth Value Judgment Task. Participants watched a video of a lion puppet, Sam, a panda puppet, Bill, and plastic animals jumping over a barnyard fence. The adults were to determine if statements regarding animals jumping over a fence were correct or not. Either 3 of 4 or 4 of 4 animals jumped over a fence in non-DE and DE contexts. Results showed that pitch-accented SOME was associated with a pragmatic implicature in both non-DE and DE environments and those DE environments canceled implicatures with *sm*. Finally, it was the de-accented *some* rather than pitch accented *SOME* in non-DE context that displayed more canceling implicatures, showing that implicature cancellation is in fact affected by pitch accent.

In the third experiment, forty English-speaking children (3;8-5;8) performed the same Truth Value Judgment Task as the previous experiment of adult participants. They, too, were asked to determine the correctness of sentences that described certain amount of animals jumping over a fence. Results showed that children in the study were in fact able to discriminate between the *some* and *SOME* in a DE environment in order to cancel implicatures in this context. Another finding reinforces the idea that children are also aware of vowel reduction, especially in implicature cancellation of *sm*. Rather than pitch accent, children appeared more aware of vowel reduction as in the distinction between *sm* and *some*. This idea rejects previous studies that children under seven years old are not able to generate and cancel implicatures and rather that children use stress as a way to make these conclusions.

Grinstead (2010) furthers Thorward's study with the same experiment but expands the sample size in order to get more accurate results. In his experiment, Grinstead expanded Thorward's sample size to seventy-two English-speaking children and ninety English-speaking adult participants. Results coincide with Thorward (2009) in that children are more attuned to vowel duration than pitch accent to determine implicatures and that adults cancel implicatures for contrastive stressed quantifiers in DE environments.

1.4 Research Questions

In this thesis, then, I seek to answer the following questions:

1. Does the fact that English uses phonological variants of the quantifier *some* ([sm], [səm], [sʌm]), as opposed to multiple distinct words, as in Spanish *unos* and *algunos*, slow down children's grasp of scalar implicatures? At what point do English-speaking children begin to appear adult-like in their interpretations and is their performance similar to that of Spanish-speaking children?
2. Given Snow's (2006) speculation that adult-like prosodic competence emerges with two-word syntax, do we see a relationship between an elicited production measure of morphosyntactic development and comprehension measures of the prosody-pragmatics interface?

2.0 Experiment I: Preschool English Speakers and Implicatures

The purpose of experiment 1 was to continue previous studies by Thorward (2009) and Grinstead et al (2010). Both studies focused on children's understanding of scalar implicatures in both DE and non-DE environments and found that children are more sensitive to vowel duration

than pitch to generate implicatures, specifically with the quantifier *some*. This experiment extends the study to an older age range of children to determine whether there is adult-like comprehension at this stage of life.

Specific Question: At what point do children come to have adult-like knowledge of the pragmatic-prosody interaction in their use of phonetic variants of the quantifier *some*? Do we observe more adult-like behavior in children older than those tested in Thorward (2009) and Grinstead et al (2010)?

2.1 Methods

Participants: While a total of 53 child participants began this study, only 23 typical English-speaking children (Age Range = 71 months to 107 months, Mean Age= 84.3 months) from Columbus, Ohio were included. To participate, children had to have completed IRB consent forms signed by their guardian and fall within 1 standard deviation from the mean on two standardized tests, one for language (CELF-4) and one for non-verbal IQ (KBIT). A total of 30 children were excluded. 10 children did not complete the standardized testing process. Another 9 children fell outside 1 standard deviation from the mean for their age on the CELF-4 and 6 children did not pass the fillers within the experiment. Three children were excluded for having received speech therapy in the past. Finally, two children were additionally excluded from the study as they were found to be on the autism spectrum.

	KBIT2			CELF4		
	Mean	Range	SD	Mean	Range	SD
Sample (n=23)	105.7083	134	13.93959	110.5217	36	9.806628

Table 1 – Mean Scores By Age of Participants On The KBIT2 and the CELF4

Materials: Children were assessed on a standardized language test CELF-4 (Clinical Evaluation of Language Fundamentals, 4th edition), and a nonverbal IQ test KBIT-2 (Kaufman Brief Intelligence Test, 2nd edition). To test children's knowledge of the different variants of *some* in downward entailing and implicature generating contexts, they were given the video-recorded Truth Value Judgment Task (Crain & McKee 1985) from Thorward (2009) using a lion puppet, panda puppet, a barn, a fence, and 8 sets of plastic barnyard animals. The stimuli were presented using E-Prime, with headphones. The E-Prime program recorded 'yes-no' responses using a button box, which also recorded their reaction time in milliseconds.

The CELF-4 was a standardized test to control for the nonlinguistic cognitive level of each participant. The subtests that made up the Core Language Score of the CELF-4 included 'Concepts and Following Directions,' 'Formulated Sentences,' 'Word Structure,' and 'Recalling Sentences." The combination of these subtests was to detect a language disorder or delay of each child. The KBIT-2 assessed the child's IQ and reasoning skills. The nonverbal test included in this study was the 'Matrices' subset which consisted of meaningful and abstract stimuli. The participant must use their nonverbal reasoning and problem solving skills to make connections between the items in the test.

Procedures: This experiment used a Truth Value Judgment Task (Crain & McKee 1985) in a between-subjects design. Participants were assigned to a group that only heard 1 phonetic variant of *some*, because Thorward (2009) found that using multiple variants drove participants in a within-subjects design to develop response strategies that masked their knowledge. Each child was assigned to one of the three variants of *some*. There were 7 participants in the *sm* group, 10 assigned to *some*, and 6 assigned to *SOME*. Children were asked to listen to "Sam" the lion puppet and to judge the correctness of Sam's description of the scenario. There were four target sentences, two training sentences, and two control sentences. Children were required to pass both control sentences to be included in the study.

Stimuli. There were eight sentences with animals jumping over a fence. Four target sentences were declaratives presented after a video in which either 3 or 4 of 4 animals jumped over a fence:

Implicature Generating Context

- Sm/some/SOME cats jumped over the fence.

The other two of the four target sentences appeared in an implicature-canceling syntactic context, the antecedent of a conditional sentence:

Implicature Canceling Context

- If sm/some/SOME cats jump over the fence, you owe me a quarter.

There were also two control sentences using the words “all” and “none” with either 0 of 4 or 3 of 4 animals jumping over a fence, preceded by two training sentences with 4 of 4 or 3 of 4 animals jumping over the fence, also with the words “all” or “none.”

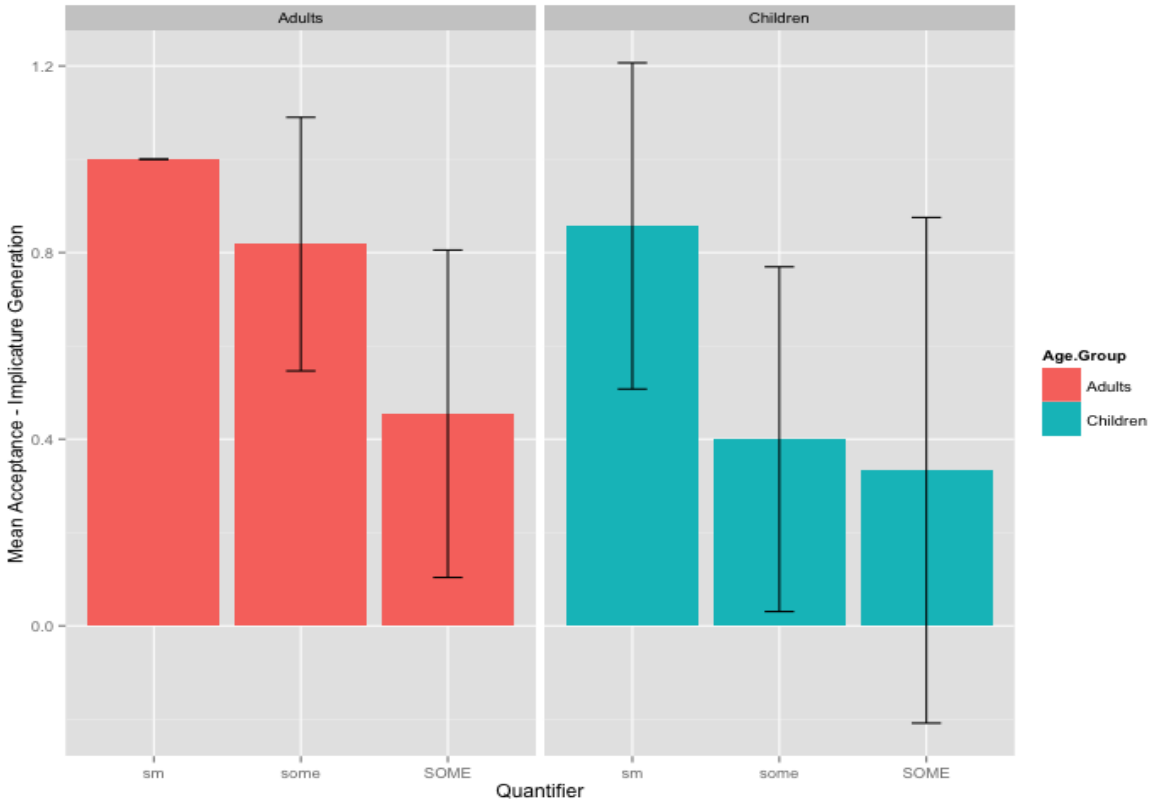
The three variants of *some* tested (from Thorward 2009) were significantly different from one another by pitch and duration, of either word (*sm* vs. *SOME*) or vowel (*some* vs. *SOME*).

- *SOME* has a higher pitch than *some* ($p < .001$) and *SOME* has a higher pitch than *sm* ($p=.001$).
- *SOME* has a longer vowel than *some* ($p < .001$)
- *SOME* is a longer word than *sm* ($p = .033$)

2.2 Results

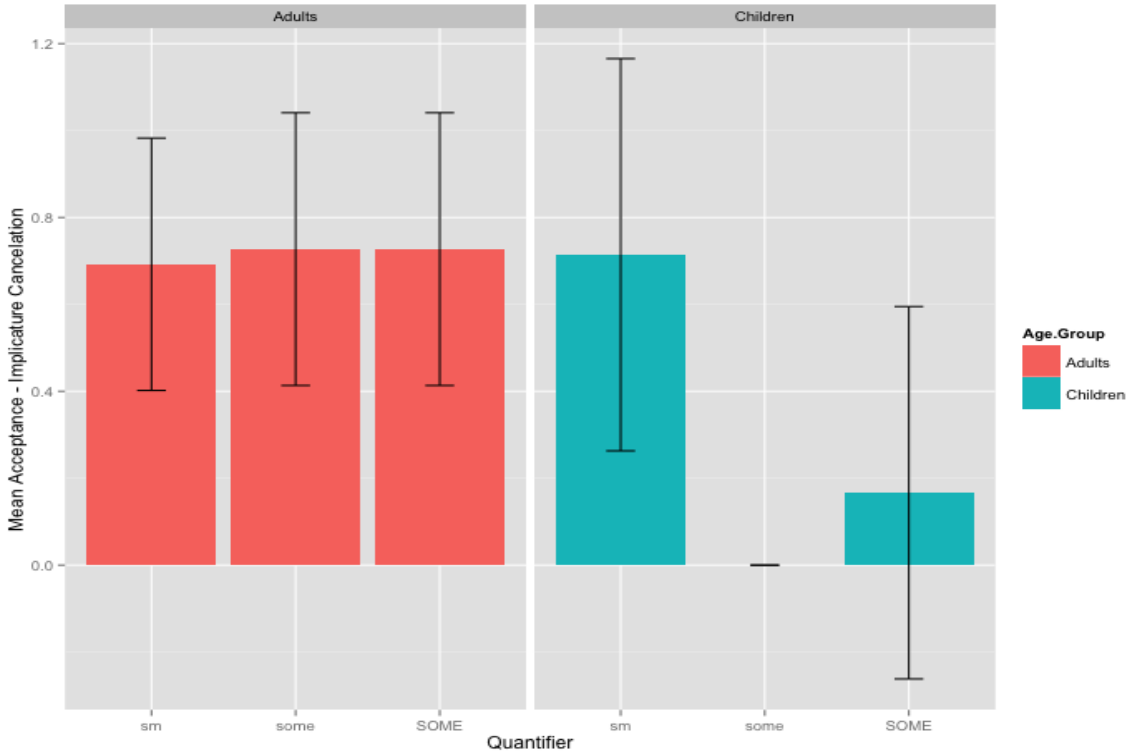
Children are not different from adults in their judgments of *sm* and *SOME* in implicature generating contexts ($p > .05$), but are different with respect to *some* (chi-square (1) = 3.884, $p = .049$). These results are similar to those of Thorward (2009), who argued that children paid attention to duration, in that long words (*some* and *SOME*) generated implicatures, while the short variant (*sm*) does not.

Figure 1- Implicature Generation



Also similar to Thorward's preschool children, our 5-8 year-olds generate more implicatures in downward entailing contexts with *some* (chi-square (1) = 11.748, p = .001) and *SOME* (chi-square (1) = 4.898, p = .027) than adults do, but not with *sm* (p > .05).

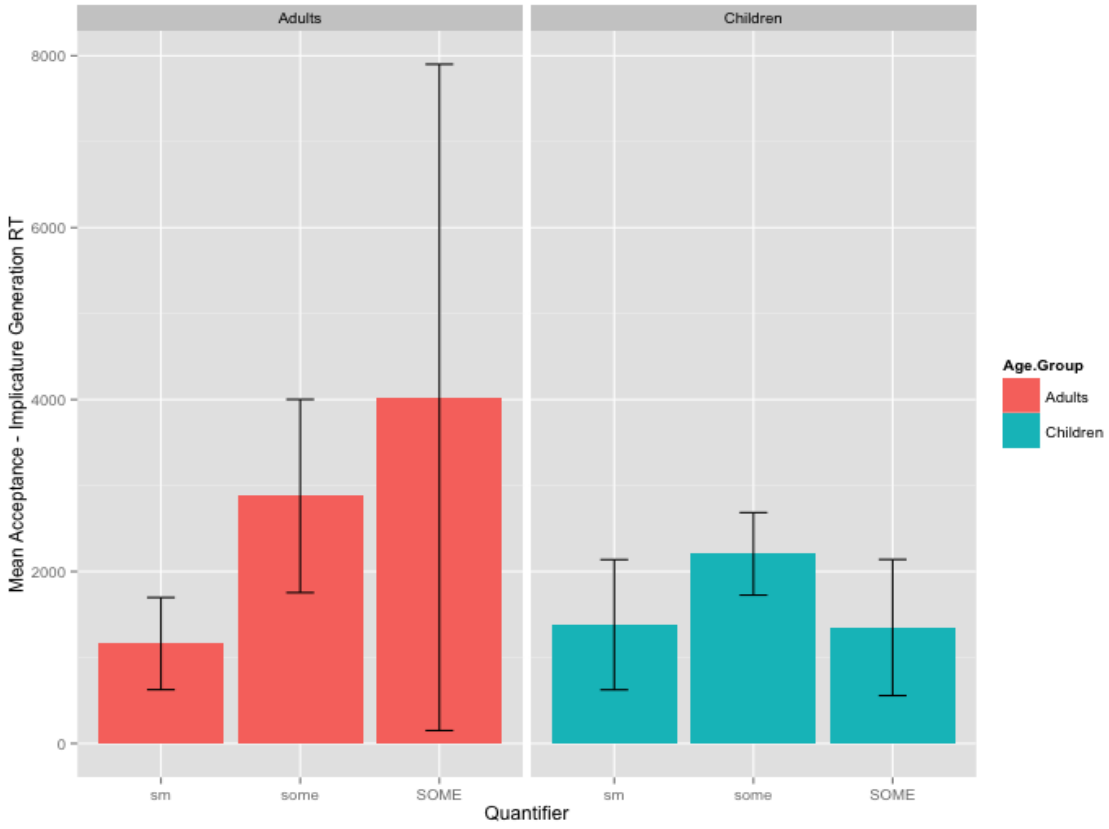
Figure 2 – Implicature Cancelation



Our second type of measure was reaction time, which is taken to be a measure of working memory associated with carrying out a particular task, in this case, generating an interpretation of a sentence.

With respect to reaction time for adults, there were no significant differences in Implicature Generation among the three variants of *some*, in my data.

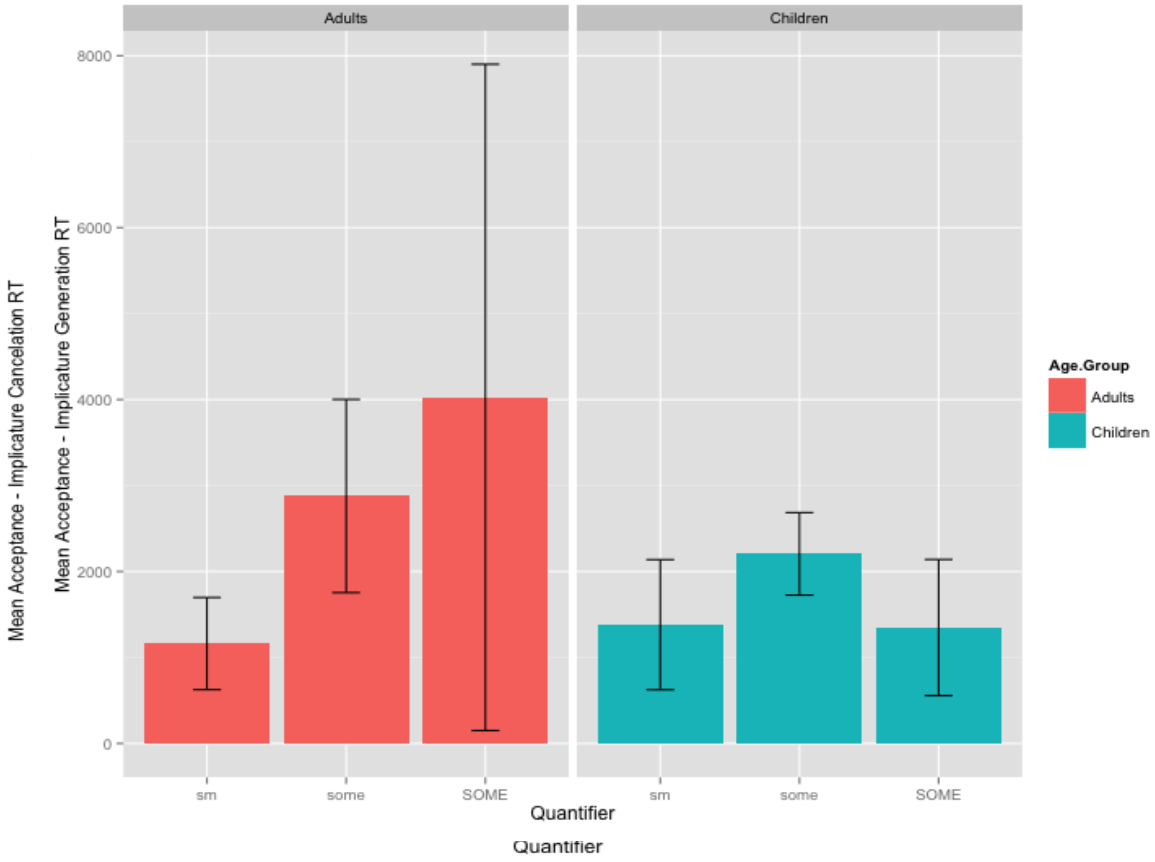
Figure 3- Implicature Generation RT



In contrast, adults were significantly faster in Implicature Cancelation with *some* than they were with *sm* or *SOME* ($F(2)=15.739$, $p < .001$, also $p < .001$ for post-hoc *sm* vs. *some* and *sm* vs. *SOME*.)

For the children, in the Implicature Generation condition, some took significantly longer than either *sm* ($p = .035$) or *SOME* ($p = .036$). There were no significant differences in the Implicature Cancelation condition, yet the data appeared to trend in the same direction.

Figure 4- Implicature Cancelation RT



2.3 Discussion

Accuracy results suggest that the roughly 7 year-old children in our sample, like the 5 year-old children in Thorward's (2009) sample, appear to depend on duration as a phonetic cue, instead of pitch and duration, to signal pragmatic implicatures. Also as in Thorward's preschool sample, our school-aged children generated more implicatures in the implicature canceling condition than adults did, except with *sm*. This ability to look adult-like with *sm* in implicature canceling contexts and with *SOME* in implicature generating contexts is probably what underlies their apparently adult-like behavior in previous work (e.g. Chierchia 2001). An intriguing result is the difference in reaction time between adults and children with some in the Implicature Canceling condition. Since *some* is the most frequent variant of "some" (Thorward 2009), it is

interesting that the children in our sample are so much slower than adults. An answer to why this is the case will have to await further research.

3.0: Experiment II: Morphosyntax and Pragmatically-Sensitive Intonation

Snow (2006) speculates that intonational development is associated with the development of two-word speech, understood by many as a developmental milestone in morphosyntax. Experiment 2 was to determine whether there was a relationship between morphosyntactic, inflectional development and the development of children's abilities to use prosody to signal implicature generation, between the ages 5 to 8 years old, as Snow (2006) might predict. To test for this relationship, we compared accuracy and reaction time data from the TVJT in the first experiment to proportion correct of selected items from the CELF-4 that corresponded to inflectional morphosyntax.

3.1 Methods

Participants: Participants were identical to Experiment 1, but children only.

Materials: Specific data was taken from the standardized CELF-4 test in order to analyze and identify any inflection-implicature correlation.

Procedures. Procedures were identical to Experiment 1.

Stimuli. 16 sentences from the CELF-4 were chosen as representative of children's expressive morphosyntactic knowledge. They include measures of noun plural marking, verb tense, genitive marking on nouns and relative clauses. Proportion correct of the morphosyntactic items was

compared to both accuracy and reaction time on the Truth Value Judgment Task measures to determine whether the relationship predicted by Snow (2006) obtains.

Ex. Sentences taken from the CELF-4:

21. Here is one book. Here are two__. (Plural)

22. The man is climbing a ladder. This is the ladder that the man___. (Tense)

23. This is Kim and this is Paula. This is Kim's mitten and this is___ (Genitive)

24. The girl is sad. Tell me about this girl __ __. (Relative)

3.2 Results

To determine whether there was a relationship between the (categorical) accuracy results from the TVJT video (experiment 1) and the (continuous) results from the morphosyntactic measures, a point-biserial correlation test was done. No significant relationship was found between the accuracy and morphosyntactic measures ($p > .05$), as illustrated in the following figure and tables.

Table 2-Statistics

Descriptive Statistics

	Mean	Std. Deviation	N
Inflection	.866477	.0825006	22
IG	.55	.510	22
IC	.27	.456	22

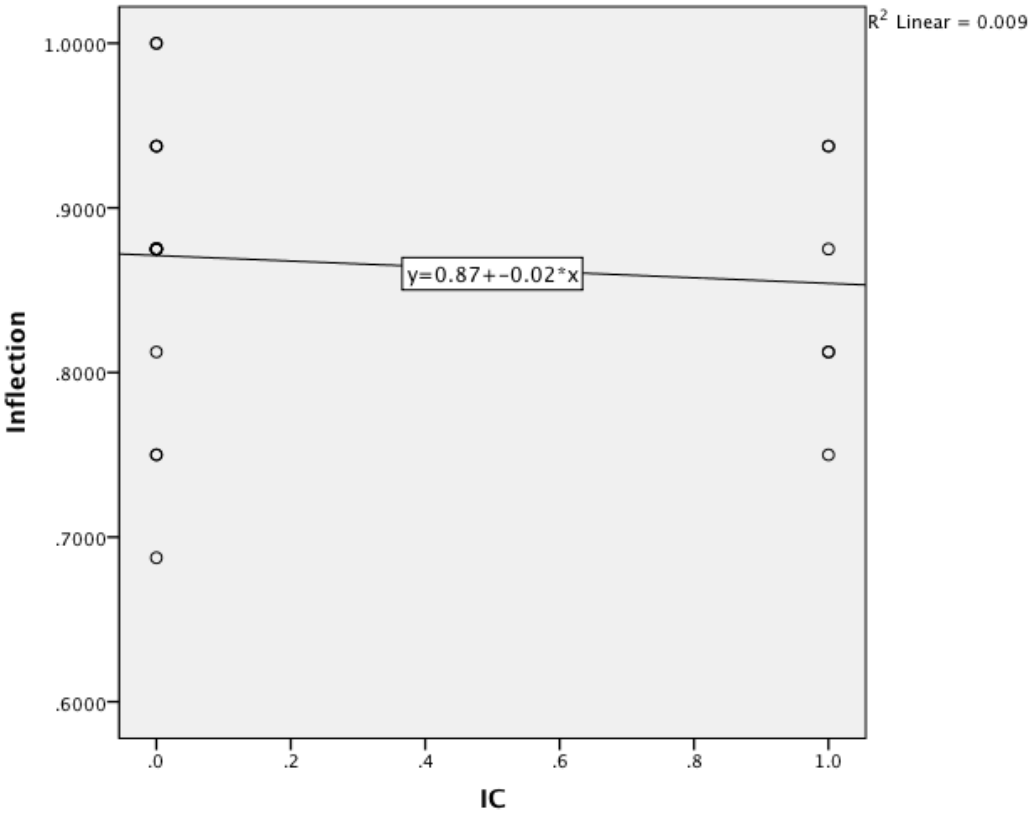
Table 3- Correlations

Correlations

		Inflection	IG	IC
Inflection	Pearson Correlation	1	-.238	-.094
	Sig. (2-tailed)		.286	.679
	N	22	22	22
IG	Pearson Correlation	-.238	1	.559**
	Sig. (2-tailed)	.286		.007
	N	22	22	22
IC	Pearson Correlation	-.094	.559**	1
	Sig. (2-tailed)	.679	.007	
	N	22	22	22

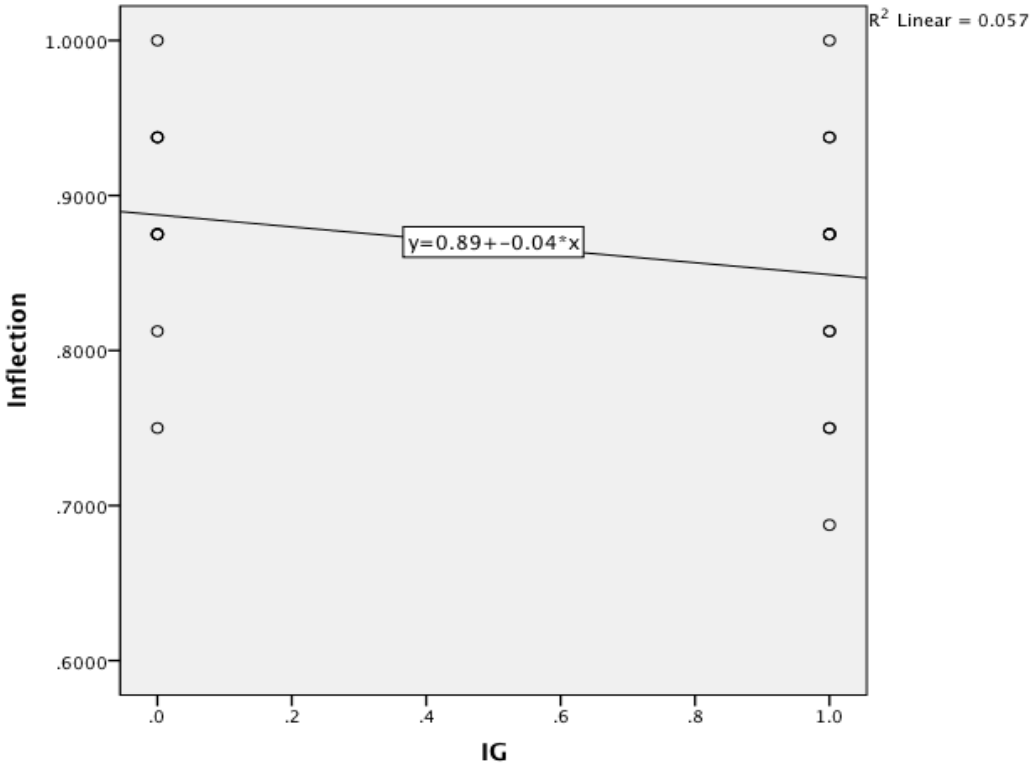
**. Correlation is significant at the 0.01 level (2-tailed).

Figure 5- Inflection From the CELF-4 vs. Accuracy in the Implicature Canceling Context



Z

Figure 6- Inflection From the CELF-4 vs. Accuracy in the Implicature Generating Context



Pearson Product Moment Correlation between inflection and reaction time in the Implicature Canceling condition, in our small sample, seemed promising, but not significant (r= -.318, p = .15). Results trend in the direction of children doing better at inflection, the faster their reaction time is with *some*. This is illustrated in the following correlation table, and figures.

Table 4- Statistics

Descriptive Statistics

	Mean	Std. Deviation	N
Inflection	.866477	.0825006	22
IG	.55	.510	22
IC	.27	.456	22
IGrt	1715.77	839.062	22
ICrt	2436.59	2804.208	22

Table 5- Correlations

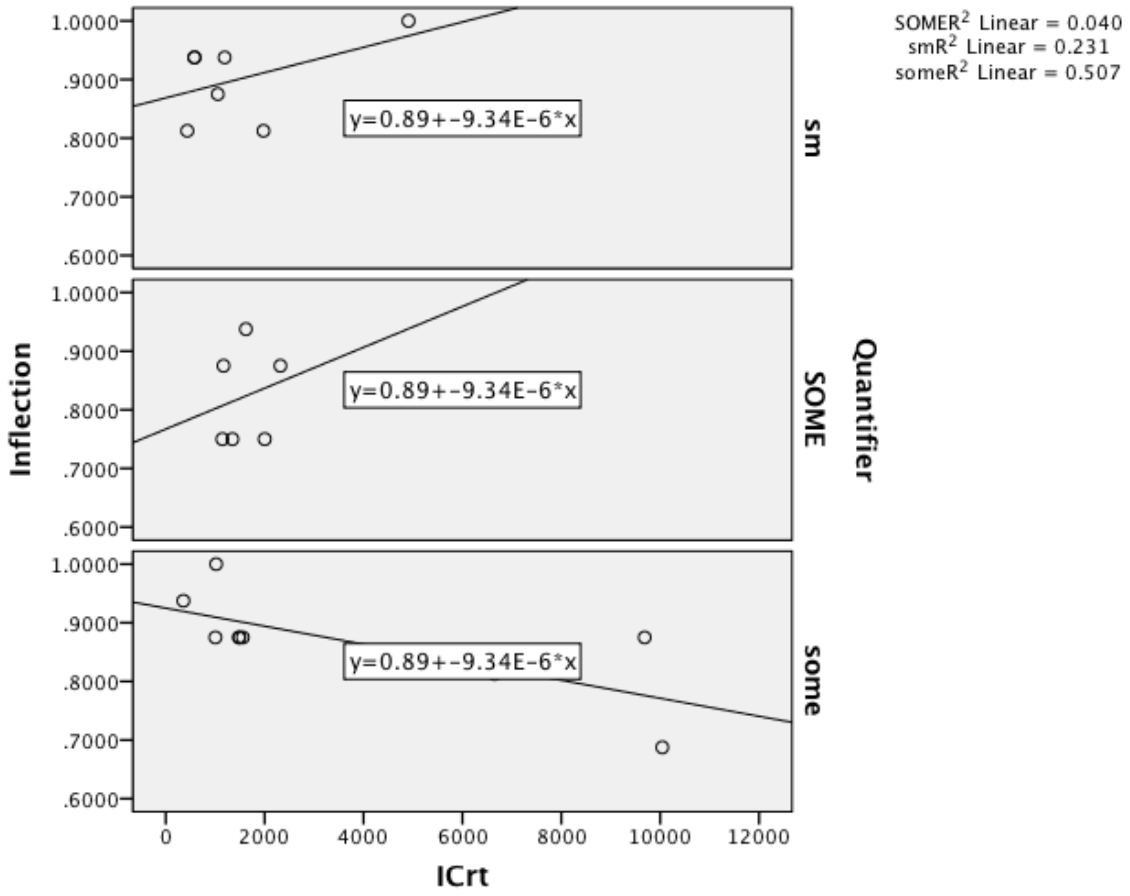
Correlations

		Inflection	IG	IC	IGrt	ICrt
Inflection	Pearson Correlation	1	-.238	-.094	-.059	-.318
	Sig. (2-tailed)		.286	.679	.794	.150
	N	22	22	22	22	22
IG	Pearson Correlation	-.238	1	.559**	.109	.187
	Sig. (2-tailed)	.286		.007	.628	.404
	N	22	22	22	22	22
IC	Pearson Correlation	-.094	.559**	1	-.358	-.307
	Sig. (2-tailed)	.679	.007		.102	.164
	N	22	22	22	22	22
IGrt	Pearson Correlation	-.059	.109	-.358	1	.447*
	Sig. (2-tailed)	.794	.628	.102		.037
	N	22	22	22	22	22
ICrt	Pearson Correlation	-.318	.187	-.307	.447*	1
	Sig. (2-tailed)	.150	.404	.164	.037	
	N	22	22	22	22	22

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 7- Inflection vs. Reaction Time In Implicature Canceling Contexts, For Each Quantifier Variant (sm/SOME/some)



3.3 Discussion

In our small sample, there is no relationship between accuracy and morphosyntax (inflection), contra what Snow (2006) might predict. The possible connection between morphosyntax and reaction time is interesting, particularly in implicature canceling syntactic contexts, given children's non-adult-like tendency to generate implicatures in them. While these results are not definitive, we were not able to confirm Snow's speculation on the basis of our small sample.

Chapter 4 – General Discussion

This study focused on child language development in relation to their knowledge of pitch accent, duration, and vowel reduction with the existential quantifier "some," and its relationship to semantic and pragmatic interpretations in downward and non-downward entailing grammatical environments. Three variations of "some", among others, are used in the English language including *sm* (no pitch, no vowel), *some* (no pitch, vowel), and SOME (pitch L+H*, vowel). Previous research has shown that both adults and children are able to make recognize distinct interpretations of *some*, however knowledge of prosodic influences was previously studied to a lesser degree. It was speculated that children's knowledge of prosody increases with two-word syntax according to Snow (2006), while other research by Chen and Fikkert (2007), Frota and Vigário (2008), and Prieto et al (2008) argue that lexical development, and not syntax, is relevant to intonational development. Finally, Cruttenden (1985) and Wells et al (2004) also argue that children are late to develop adult-like interpretations of prosody.

In order to begin understanding the contribution of phonetic variables to children's knowledge of such language development, experiments done by Thorward (2009) and Grinstead et al (2010) began to systematically control the potentially conflicting influences of these variables through their studies with pre-school children. Their research concluded that children ages 4 to 7 did not perform at adult-like comprehension levels. Our study continued this research by targeting older children ages 5 to 8 to determine if at this age range children begin to look more adult-like in generating and canceling implicatures. Another question our experiment has addressed is if there is a relationship between morphosyntactic inflection and the prosody of implicature generation.

Both experiments in our study have utilized diagnostic tools and methods previously used by Thorward (2009). Experiment 1 continues to use the E-Prime software and video to test

children's pragmatic knowledge. The CELF-4 standardized language test was also included in the second experiment in order to further these understandings.

Results of our first experiment appeared to reflect findings similar to those of Thorward (2009) work. In fact, our 5 to 8 year old children continued to depend on duration as a phonetic cue to generate implicatures, rather than pitch and duration together. Also, these kids generated more implicatures in canceling environments than adults did, apart from the variation *sm*. This difference may account for why children have appeared to be adult-like in previous work done by, for example, Chierchia et al (2001). English-speaking children, in this way, appear to depend more on the development of prosody for expressing semantic-pragmatic distinctions than do child Spanish-speakers (e.g. Vargas-Tokuda et al 2009).

Results of our second experiment measured the proportion correct of the morphosyntactic items compared to both accuracy and reaction time on the Truth Value Judgment Task measures to determine whether the relationship predicted by Snow (2006) still obtains. Our results showed no significant correlation between implicature generation and inflection. However, children did seem to do better at inflection the faster their reaction time was with *some*.

Future investigation of this study should aim to target a larger and older age group in order to answer our question of at what age children begin to take on adult-like behaviors in acceptance and rejection of quantifiers in both implicature generating and canceling environments. This data will hopefully encompass a larger sample size to fully get a better representation of these child age groups and more accurate results. Finally, this study may be able to extend to non-typically developing children who seem to struggle with pragmatics such as those with Autism. Comparison between typical and non-typical children will allow for better

understanding of language development and better prepare professionals in both educational and clinical environments to assist in developing language in a more enriching context.

Appendix

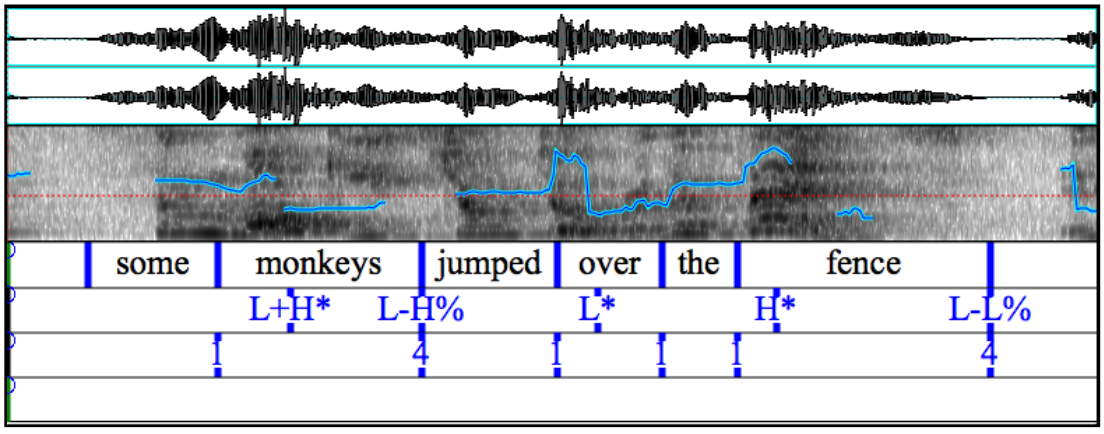
The Autism & Child Language Learning Lab Background History Form:

	Average Maternal years of education	Did not pass control trials: T1, T2, T4, T7	Did not complete standardized testing	Not within one SD of norm with standardized testing	Received past speech therapy	Autism spectrum
#	**17.833 years**	**6 kids**	**10 kids**	**9 kids**	**3 kids**	**2 kids**

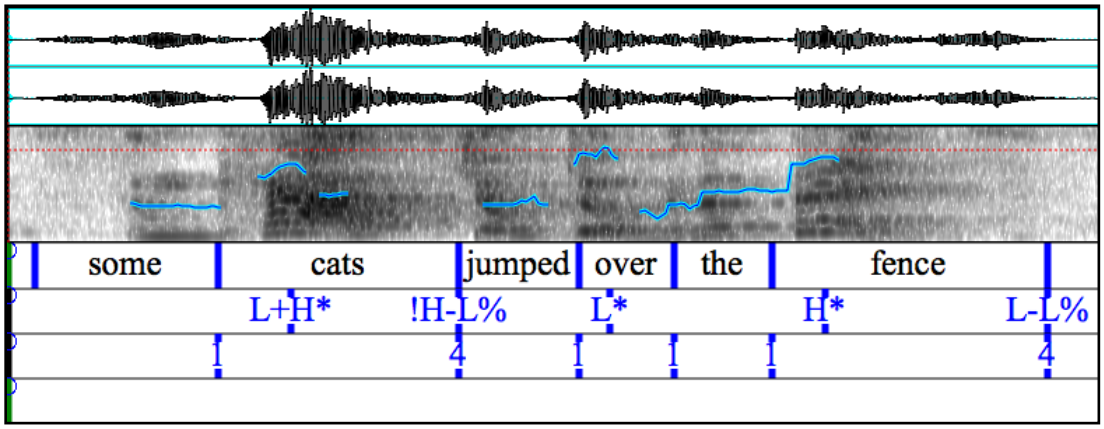
ToBi Transcription of Target Sentences from Thorward (2009): Prosodic transcription of recorded stimuli sentences in implicature generating (IG) and downward entailing environments (DE)

ToBi Transcription of Target Sentences: ***Sm***

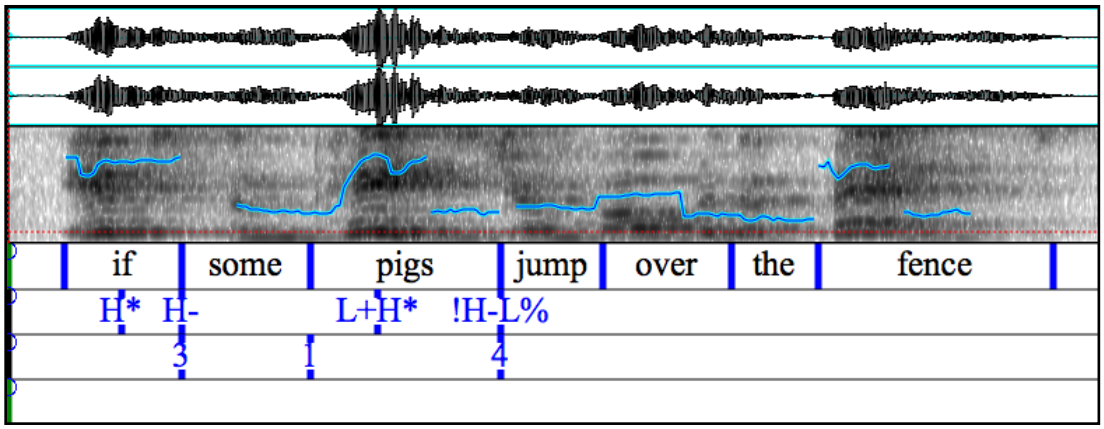
IG: "*Sm* monkeys jumped over the fence"



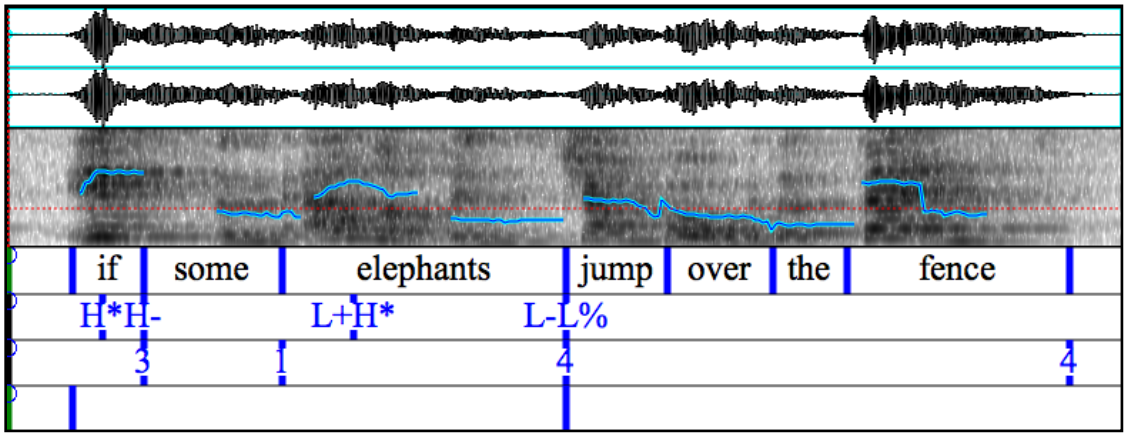
IG: “*Sm* cats jumped over the fence”



DE: “If s*m* pigs jump over the fence”

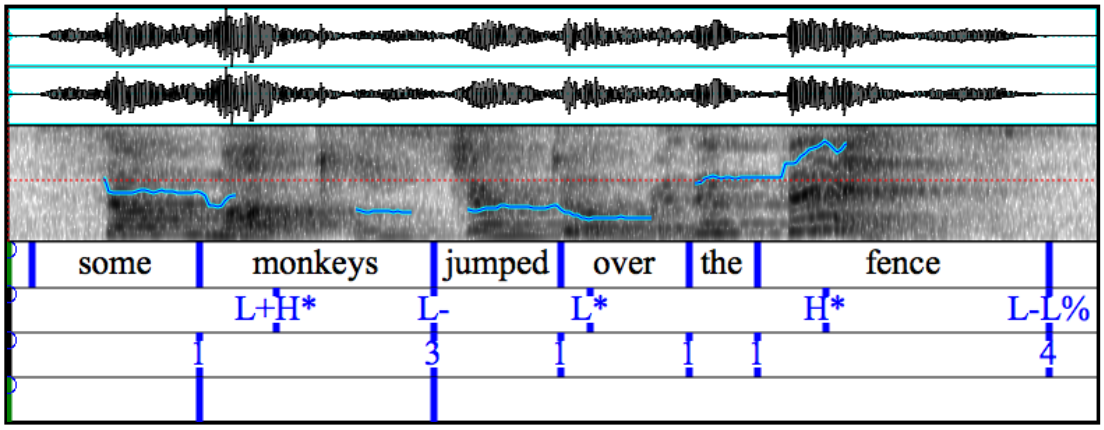


DE: “If s*m* elephants jump over the fence”

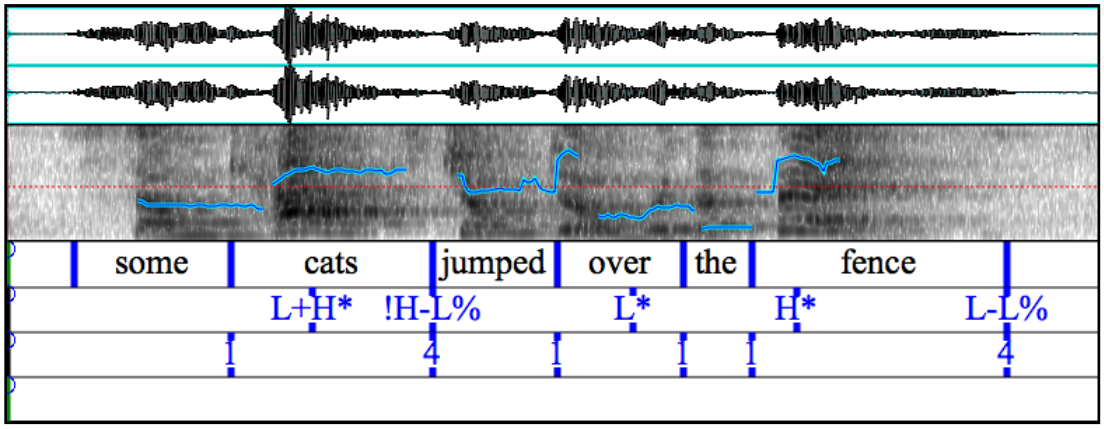


ToBi Transcription of Target Sentences: ***Some***

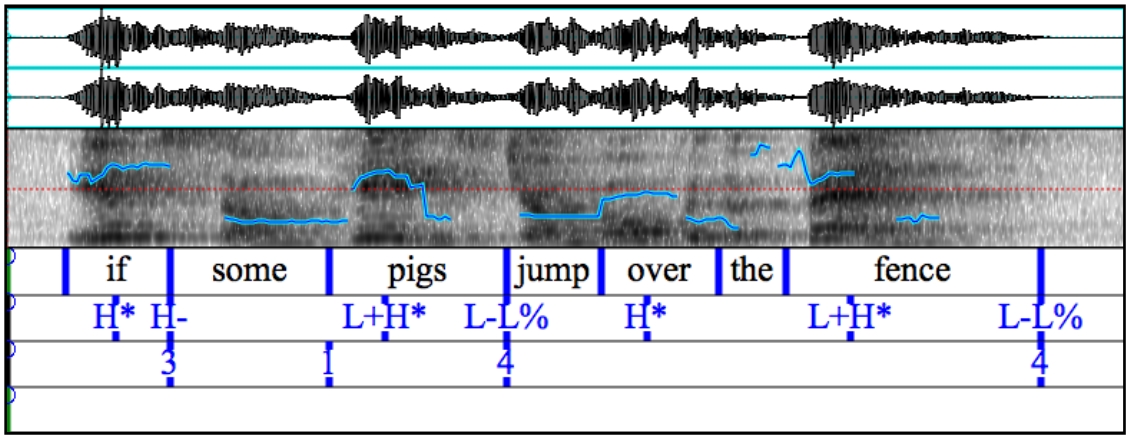
IG: "*Some* monkeys jumped over the fence"



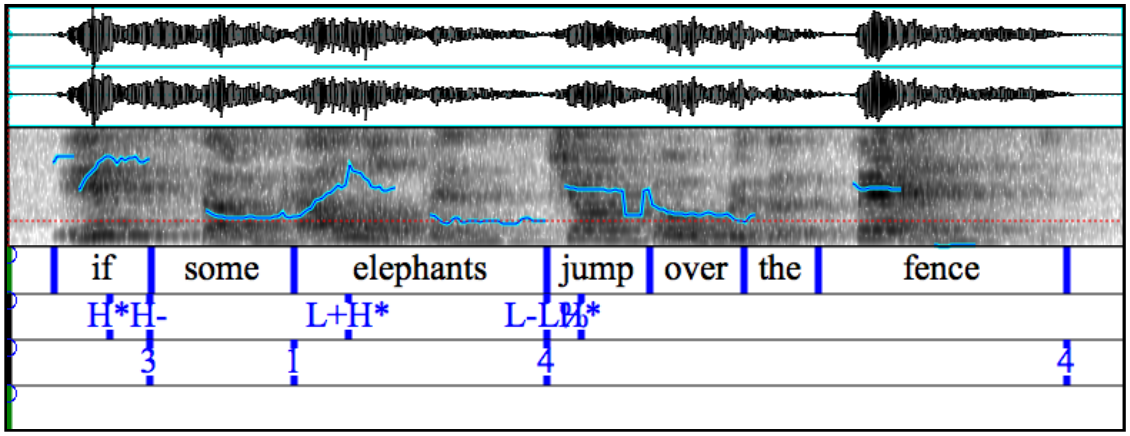
IG: "*Some* cats jumped over the fence"



DE: “If *some* pigs jump over the fence”

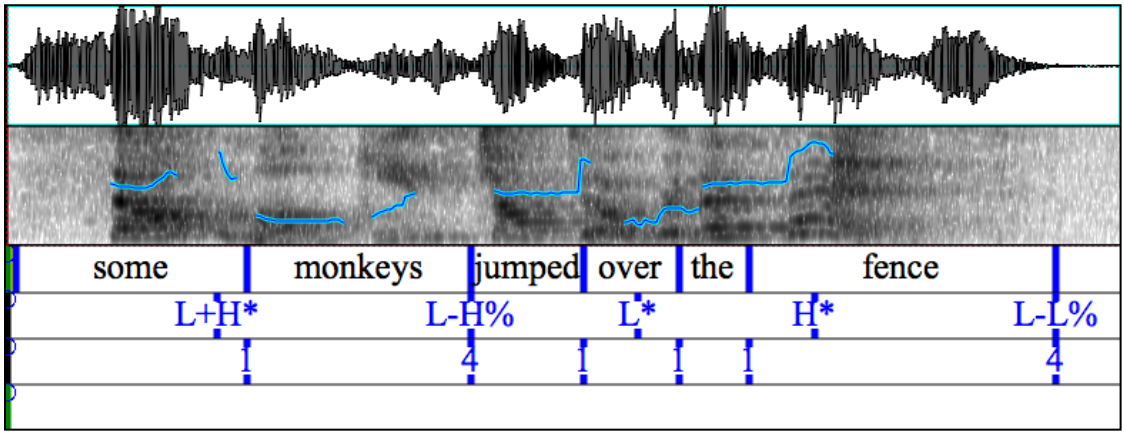


DE: “If *some* elephants jump over the fence”

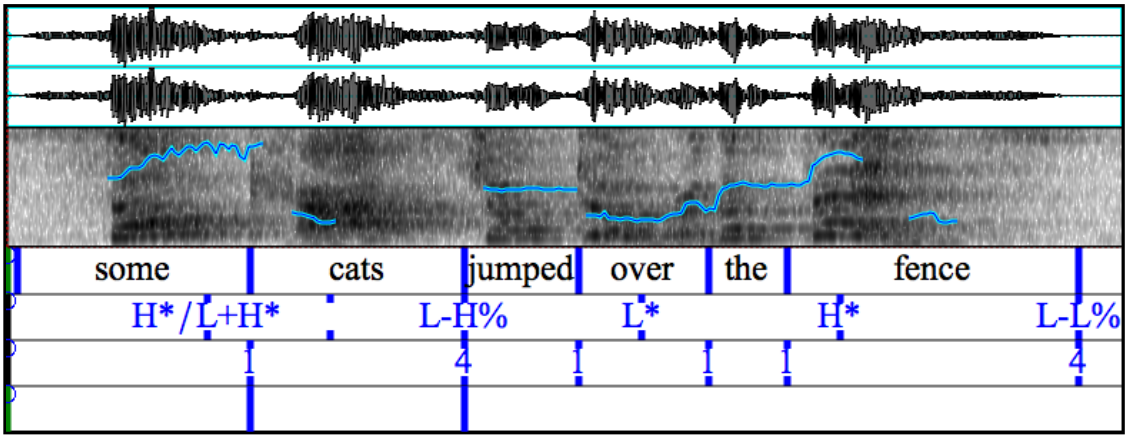


ToBi Transcription of Target Sentences: ***SOME***

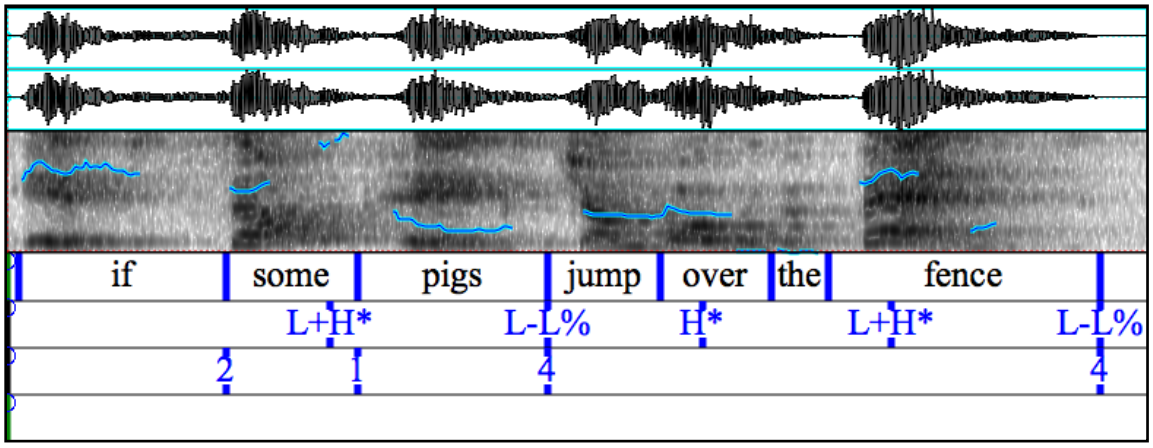
IG: "*SOME* monkeys jumped over the fence"



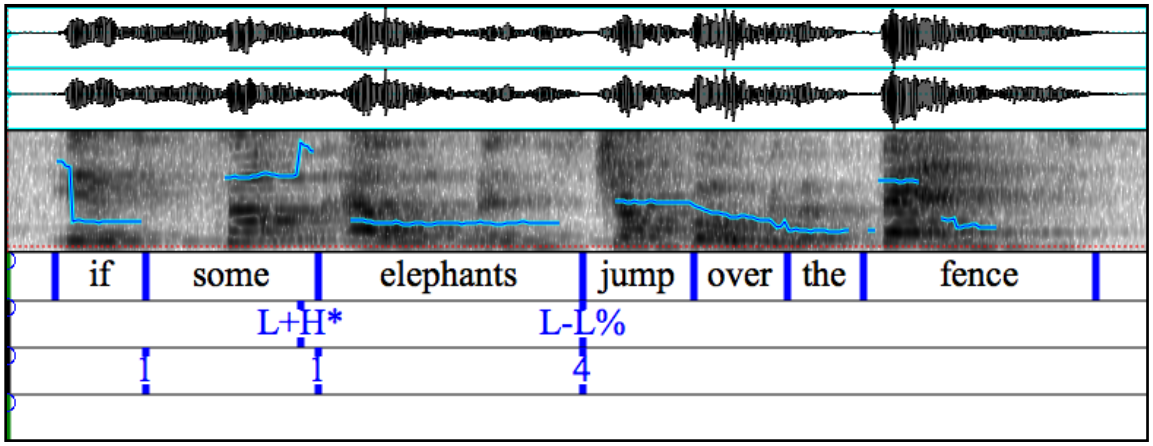
IG: "*SOME* cats jumped over the fence"



DE: “If *SOME* pigs jump over the fence”



DE: “If *SOME* elephants jump over the fence”



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